INITIATIVES AND ACHIEVEMENTS IN THE COLD DESERTS OF HIMACHAL PRADESH & JAMMU & KASHMIR

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Background:

Desertification is one of the most serious problems facing the world today. Large tracts of the dry areas that cover more than one third of the earth's crust are being degraded or are in the process of degradation, posing serious threats to environment. These areas also include the most severe category of the deserts known as The Cold Deserts lying mostly in the mountainous regions of the world. Spiti in Himachal Pradesh and Laddakh in Jammu & Kashmir have such areas those need to be worked upon scientifically.

The Western Himalayas – the area falling within the purview of this institute - has two biggest ranges, namely the Lesser Himalayan Range and the Greater Himalayan Range. These ranges run parallel to each other and enclose innumerable plateaus and beautiful narrow, wide and extremely high valleys. These ranges, of-course, meet each other across a landscape of snow and boulders and whatever this panorama presents in the inter-stices of this mesh, are nothing but the cold deserts of Lahaul-Spiti and Ladakh. To be specific these areas--rather the areas with a difference -- occur in Ladakh region of Jammu and Kashmir (J&K), Lahaul & Spiti, Pooh sub division of Kinnaur, and in Pangi area of Himachal Pradesh (HP). In the state of J&K cold desert lie in between 32^{o} 15′– 36^{o} N latitude and 75^{o} 15′- 80^{o} 15′ E longitude whereas in HP these areas fall in between 31^{o} 44′ 57′′-32^{o} 59′ 57′′N and 76^{o} 46′ 29″ –78^{o} 41′ 31″E. Very small pockets of such areas are also found in Garhwal (Niti and Mana) beyond Badrinath and Nelang region of Uttar-Kashi district in the state of Uttar Pradesh. The state and district wise distribution of the Cold Deserts has been given in the table below:

Table-1: State and District-wise Distribution of the Cold Deserts in India.

Sl. No	State	District	Approximate Area in 000 Sq. Km.	Percent Geographical Area of the State	Percent Cold Desert
1.	**Jammu & Kashmir**	Ladakh	82.60*		
		Kargil	14.00	43.00	90.00
2.	**Himachal Pradesh**	Lahaul & Spiti (part)	07.60 }	20.00	10.00
		Kinnaur (part)	03.40 }		
TOTAL		**107.60**		**100.00**	

* Includes 37.60 thousand sq. km. of area under occupation of China and Pakistan

Vegetation of Cold Desert of Himalayas:

The floristic accounts of the Indian cold deserts of which Lahaul Valley also forms a part, have been largely described under **'Western Himalayas'** by the early phytogeographers (Hooker, 1906 and Chatterjee, 1939). Various authors have described the vegetation of this region as *Caragana-Lonicera-Artemisia* formation (Osmaston, 1922); Zone of Dry bushes (Nako, 1955); Alpine Steppe (Schweinfurth, 1957); Dry alpine scrub (Champion and Seth, 1968) and Alpine stony deserts (Puri *et al*., 1989). The vegetation in Cold Deserts infact, varies from semi-desertic to desertic, depending upon the prevailing bio-climate. The desertic climate is also prevalent in Lahaul and Spiti region of Himachal Pradesh, however, in parts of Lahaul, there are some pockets where the general desert conditions find a change due to the occasional escape of monsoon winds bringing mild showers. According to Champion and Seth's (1968) classification, the natural vegetation may be assigned to the following broad forest types:

15/C3	**---**	**Alpine pastures**
16/C1	**---**	**Dry alpine scrub**
16/E1	**---**	**Dwarf juniper scrub**

Amongst the woody shrubs and trees - both indigenous and introduced - and which are of special significance and of direct relevance to the local populace for meeting their requirements of fodder, fuel and small timber are: *Salix elegans* Wall., *S.alba* Linn., *S.fragillis* Linn., *S. sclerophylla* Anderss., *Populus alba* Linn., *P. euphratica* Linn., *P. ciliata* Wall., *Juniperus polycarpos* C. Koch., *J. communis* Linn., *J. recurva*, *Astragalus spp., Artemesia spp., Myricaria bracteata* Royle., *Hippophae rhamnoides* Linn., *Tamarix gallica* Linn., *Elaeagnus angustifolia* Linn., *Caragana pygmea* DC., *Atriplex crassifolia* C.A Mey., *Ephedra spp., Rosa webbiana, Medicago sativa* and *Haloxylon thomsonii* Bunge.

Indian Council of Forestry Research and Education (ICFRE), Dehradun, declared **Himalayan Forest Research Institute, Shimla** as "**Centre of Advance Studies for Cold Desert Afforestation and Pasture Management**"

A. Research Activities Carried Out in the Cold Deserts of Himachal Pradesh and Jammu & Kashmir

1.) Checking of Willow Mortality in Lahoul Valley:

The willow species is one of the most important species with the multi-faceted uses to the local populace of Lahaul Valley. However, the large scale mortality of Willow in Lahaul in the recent past became a matter of prime and immediate concern and caught the attention of the people and the government of Himachal Pradesh as it is considered as the *lifeline* for the local populace.

Willow Mortality in Lahaul

The Institute took it as a challenge and conducted extensive survey and research to check and arrest the Willow mortality in the valley and came up with the appropriate solutions for the same. As outcome of the efforts;

- Number of reasons for Large Scale Mortality were identified and site-specific management strategies for their rejuvenation and conservation were put in place.
- Research Nurseries were established at Sisoo (Lahaul) and at Tabo (Spiti) for raising Quality Planting Stock of various imported clones

Giant Willow Aphid Infestation on Salix

- Screening of clones, species and provenances of Willow was carried out keeping in view their height- growth performance and their resistance towards insect-pest incidences with special reference to Aphid attack.

- Field Demonstration Plantations were established both in Forest Lands (Sisoo), Community Land (Khangsar) and also in Farmer's Fields of course, in close liaison with all these stakeholders

- Based on the experience sharing and findings of the present study, specific conclusions have been made and recommendations suggested for dealing with this environmental issues in the Lahaul Valley

2) Breaking of Seed Dormancy in *Juniperous polycarpos* (Shukpa):

Juniperus polycarpos seedlings successfully raised in the Nursery

Juniperus polycarpos C. Koch syn. *Juniperus macropoda* Boiss. commonly known as **"Himalayan Pencil Cedar"** is an important endangered conifer tree species found in inner arid areas of the Western- Himalayas. It is locally known as "**Shur", "Shukpa", "Thelo**" or **"Shuru"** in Kinnaur and Lahaul & Spiti district and Laddakh region of Jammu & Kashmir. Socio-economic and ecological point of view, *Juniperus polycarpos* is considered as an important tree species in its zone of occurrence in North-Western Himalayan region and is regarded as a sacred tree.

The natural as well as artificial regeneration in *Juniperus polycarpos* is quite low due to the phenomenon of seed dormancy. Till date, no success has been achieved in overcoming seed dormancy in this valuable endangered conifer species. *The institute finally got some breakthrough in overcoming seed dormancy in this valuable conifer tree species and good beginning has been made.* The seedlings of *Juniperus polycarpos* raised through seed have been continuously monitored in the nursery.

3) Development of Nursery Techniques of Prominent Cold Desert species:

In the cold desert areas, major threats to the vegetation are from their necessity for fodder and fuel-wood and also to fulfill the other socioeconomic requirements of the local populace. For eco-restoration of cold deserts one of the important activities is to provide vegetal cover over its barren tracts and to make the areas, self sufficient for fulfilling the local requirement of fodder and fuel wood. However, there is a definite lack of technological support in combating the desertification in cold desert areas. If these naturally occurring plant resources are not conserved timely then there is every chance for their extinction.

The Institute to a considerable extent has standardized the nursery techniques of prominent Cold Desert species viz. *Capparis spinosa, Colutea nepalensis., Caragana gerardiana., Ribes orientale, Cratagus songarica, Eleaegnus angustifolia* & *Rosa webbiana.* Outcome of the same has provided a sound database for taking up/ initiating further studies on standardization of their planting techniques besides providing necessary input for devising suitable strategies for arresting soil erosion in general and for future economic development and welfare of the local people/ ecology in particular.

4. Ecological Assessment of floristic diversity in Hemis High Altitude National Park, Ladakh, Jammu & Kashmir:

Floristic composition, dimensions, population size and diversity of species are most significant biological elements of an eco-system. With changes in the cropping patterns, deforestation and increasing interference of man especially with the new concept of 'eco-tourism', natural flora is being lost gradually and at times abruptly and quickly.

Hence, it is appropriate to document floral elements of this fragile region because the vegetation wealth here is among the most attractive, but somehow botanically lesser known in the country.

The Institute has taken up the studies on ecological assessment of floristic diversity in Hemis High Altitude National Park, Ladakh, Jammu & Kashmir. Through this study an attempt has been made to present briefly the accurate scientific information on correct botanical identity, common and local names, habitat, botanical description, local use and economical value. The study will be helpful in formulation of management plan for effective conservation measures in the protected areas with a clear-cut aim to conserve fast depleting natural resources.

5. Documentation of Floristic Survey of Miyar Valley, Lahaul-Spiti (H.P.):

Miyar Valley, the remote and unknown frontier of Lahaul, is amongst one of the last few remaining citadels of biodiversity in the fragile landscape of North- West Himalayas. The Institute has documented the floristic wealth of one of the most beautiful, rich but botanically lesser known areas of the Miyar Valley, L&S (H.P.). The description of 50 selected plant species belonging to 46 genera of angiosperms and a single genus of gymnosperm have been made. Field Botanists, Foresters, and naturalists and students will find this book quite useful.

6. Studies on Plant Diversity in Cold Deserts of District Kinnaur, H.P.:

The assessment of plant diversity normally provide basis for devising suitable strategies for conservation of the plant resources. Accordingly, study conducted to understand the plant diversity along an altitudinal gradient varying from 3000m – 5000m in Labrang area of Pooh sub-division in district

Kinnaur showed that the total number of plant species was 191 belonging to 47 families and 127 genera. Plant diversity study at an altitudinal gradient varying from 3000-5000 m above msl in Namgia area were conducted under this project. In Namgia area, the studies reveals that the total number of plant species were 142 belonging to 49 families and 105 genera. The dominant families were Asteraceae, Polygonaceae, Raununculceae and Rosaceae. The number number of tree species at 3000-5000 m elevations was 8 with dominance of *Populus nigra.* The number of shrubs species were 17, 8 6 & 2 in the election of 3000-3500 m, 3500-4000 m, 4000-4500 m and 4500-5000 m respectively.

7. Identification of Superior Genetic Stock of *Podophyllum hexandrum* (Bankakdi) from H.P. and J & K:

Podophyllum hexandrum Royle is an herbaceous and rhizomatous species of high medicinal value species of north western Himalayas and valued for its alkaloid podophyllotoxin and its semi-synthetic compounds, the etoposide, teniposide, and etoposide phosphate used in treatment of specific types of cancers.

The growing resources of the species are rapidly declining due to excessive exploitation and poor natural regeneration capacity. It has poor seed germination if not given a treatment. The most important aspect for cultivation is the identification of promising strains/ population of medicinal plants from natural condition and to multiply the same for commercial cultivation, so as to ensure high quality and better returns to the farming communities. Development of cost effective propagation methods will further help to mass multiplication of elite planting material thus making sure for the availability of quality planting stock to go for commercial cultivation of the species. As the species is

already endangered, and exploitation of its underground parts continues to exceed the rate of natural regeneration, it needs immediate attention for conservation. Accordingly, the Institute initiated following efforts:

- The Institute has carried out extensive surveys to identify the superior genetic stock of *Podophyllum hexandrum* in different geographical locations (25 No.) of Himachal Pradesh and Ladakh (J & K) and collected genetic material from the same.

- Trials has been conducted to develop user friendly propagation methods of the species

- On the basis of high active ingredient content identified the superior chemo-types and has established the Field Gene Bank (FGB) of the same.

8. Planting Stock of Cold Deserts:

Under Production of Quality Planting Material (QPM- PSCD), the institute has distributed about 65000 number of Cold Deserts species viz. *Hippophae rhamnoides, Colutea neplensis, Elaeagnus angustifolia, Rosa webbiana* and *Capparis spinosa, Ribes orientale, Betula utilis* to *State* Forest (Wildlife Wing) Himachal Pradesh during 2010.

9. Herbarium Taxonomic Sheets of Cold Desert species:

The herbarium established in July, 2000, has a collection of around 8000 specimen sheets mounted and pasted as per standard procedures mainly from the NW Himalaya and the Cold Deserts. The Herbarium has contributed specimens each to the DD and BSI Herbaria at Dehradun. It also aids in identification of voucher specimens from other organizations on payment basis (FSI, HPU, etc.); Sale of Herbaria sheets; Educating school children and other visitors about Herbarium methods and Biodiversity Conservation.

Around 354 species of 102 families of Cold Desert has been kept as taxonomic sheets for future referencing.

B. Establishment of Van Vigyan Kendra at Janipur, Jammu (J. & K.):

Apart from creating a facility to undertake forestry research in distinct ecological zones, Indian Council of Forestry Research has also taken up the mandate of dissemination of research findings to the end users and from time to time. ICFRE has initiated a scheme of establishment of Van Vigyan Kendras in the States of Himachal Pradesh and Jammu & Kashmir in collaboration with the State Forest Departments in order to institutionalize the transfer for research findings and new technologies to the end users i.e. farmers, NGOs, state forests departments etc.

- Van Vigyan Kendra (VVK) was established at State Forest Research Institute (SFRI), Janipur, Jammu (J&K) on dated December, 2009. Mrs Neelu Gera, IFS has been designated as nodal officer for VVK, Jammu & Kashmir.
- As far as extension activities as envisaged through Van Vigyan Kendras in Srinagar and Leh are concerned, these shall be carried out from the proposed FRS in Ganderbal and Leh respectively.

D. Field Research Stations

i) Field Research Station at Leh (J.K.)

As far as research on Cold Deserts in Ladakh region is concerned, the institute is focusing on standardization of techniques for eco-rehabilitation of Cold Deserts by standardizing the nursery and planting techniques of the species endemic to the region. But to manage or to tackle such problems in these areas in the state of J&K, HFRI is in the process of establishment of a Field Research Station at Badami Bagh and Nursery at Gupuk, Leh.

Accordingly the Institute has recently established a Field Research Station at Badami Bagh, Leh (J.K.).

ii.) Field Research Station at Tabo (H.P.)

To cater to the forestry research needs of cold desert, the Institute has well established nursery at Tabo, Kaza.

E. Extension:

Since the inception of this institute numbers of workshops/ trainings/ Liaison meetings have been organized for the benefit of different stakeholders in the Cold deserts areas of H.P. and J & K.

F. Proposed Activities in the Cold Desert of J. & K.

- Development of afforestation techniques.
- Introduction of new strains/ varieties/ species.
- Soil moisture conservation in fragile areas through biological interventions.
- To carryout floristic survey of Leh, Ladakh region.
- To collect, maintain and produce superior germ-plasm of important species apart from collection and maintenance of species of medicinal importance and also of the fodder trees to cater the requirements of these commercially important species.
- To establish Field Gene Bank (FGB) of locally available important species for future improvement programme.
- To develop agro-techniques of high valued commercially important medicinal plants and creation of medicinal plants awareness in the region.
- To study the effect of climate change on local vegetation and other insect pest disease and to suggest the mitigation strategy for the same. Automatic weather station will be installed to record climatic data over a period of time.

G. Constraints:

- Lack of specialized scientific manpower in the field of Cold Desert.
- In the Institute there are vacant posts of supporting staff as R.A. -1, Forest Guard-5 No, and Technical Assistant- 3 No. These posts need to be filled at the earliest.
- Since the Institute has been declared as "Centre of Advance Studies for Cold Desert Afforestation and Pasture Management", since 2003 however desired studies could not be carried out owing to limited manpower and resources.

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